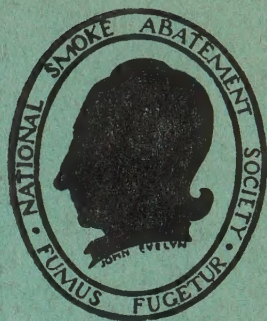


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PROCEEDINGS

of the

ELEVENTH ANNUAL CONFERENCE

of the

National Smoke Abatement Society

held at the Caxton Hall, London, S.W.1,
on 5th November, 1943

MEASURES FOR SMOKE PREVENTION IN RELATION TO PLANS FOR POST-WAR RECONSTRUCTION

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MEASURES FOR THE PREVENTION OF SMOKE IN RELATION TO PLANS FOR POST-WAR RECONSTRUCTION

Morning Session

Chairman: Sir Lawrence Chubb

In his opening remarks the Chairman welcomed the members and delegates attending the first conference of the Society to be held since the war began. He stated that the author of the address to be read, Mr. Clough Williams-Ellis, unfortunately found it impossible to be present in person, but that he had kindly written his paper. He called upon the Secretary to read this to the meeting.

UNHOLY SMOKE

By Clough Williams-Ellis
M.C., F.R.I.B.A.

FUNNY, you would think that by now, the last word about smoke pollution *must* have been said, but quite clearly it hasn't been, either by me or by anyone else, for if it had, that magic word would have exorcised for ever the gloom-demon that still plagues us.

True, we also still put up with all manner of other perfectly avoidable follies and nuisances that a little more commonsense, co-operation and determination could readily abolish, but I doubt whether there is any reform so generally recognised as necessary, so obviously and quickly feasible and that, further, would yield such immense and immediate improvement in return for a short, sharp and determined "Blitz," as that against our centuries old oppressor, smoke.

Grumble, oh, yes, we *grumble* all right, and have done increasingly for three or four centuries at least, but we

have done little more than just shrug our shoulders and say "Filthy nuisance," accept it as inevitable (as we long so accepted plague and famine until we realised that they *weren't*), still adding our own individual contribution to the life-denying pall with the feeling that where all are so foolishly selfish, what could one man's virtue signify?

That may not be a highly moral attitude to adopt, but it is a very natural and commonsensical one. For this is a battle that cannot be won by the single combat of heroes but only by a peoples' army, led by heroes certainly, but itself filled with zeal and a conviction that its cause is good.

It is that army that this society has been steadily recruiting over many years past; it has conducted a long-drawn guerilla warfare against the enemy, it has won various quite important engagements, but it has by no means won the *war*. That, I am convinced, will only be won by a major frontal assault with overwhelming forces at a favourable time. The most favourable time for winning an anti-smoke war will be almost immediately after the anti-fascist war, and it is for that zero hour that our maximum forces must be ready, which is what we are here to do something immediate about this very day.

Coal-smoke abatement must figure prominently in any adequate planning programme; such programmes are being formulated and crystallised *now*, and it is for this Society and all of you, its friends, to see that due place is given to what especially concerns us reformers, though it of course concerns every man, woman and child in Britain no less.

I cannot pretend to be fully up-to-date with the day-to-day activities of all the beneficent bodies to which I belong, and perhaps the Smoke Abatement Society has already made effective representations to such other bodies and Government Departments as are, or should be, most immediately concerned with our humane and civilised aims. Mark you, I said effective, and no representations can be called that unless and until they have in fact had the effect actually intended, which I take to be action resulting (eventually) in the realisation of those aims.

It so happens that I am pretty intimately involved on a good many sectors of the far-flung planning front, but I am not at present conscious of anything like sufficient stress being laid on this smoke question. That would seem to suggest that something further is necessary—some short sharp factual and statistical broadside or broadsheet giving well authenticated evidence that cannot be challenged, scientifically vouched for and supported by those whose authority as expert witnesses must command official attention. In a vague sort of way everyone knows that smoke is a harmful nuisance that no really self-respecting and fully civilised community would continue to tolerate—they will agree to all that I say—but as we have seen, it is not enough. They know it is “bad,” but we have failed I think to make them realise *how* bad, and that’s just what well tabulated statistics would do.

All can understand that the emission of smoke is obviously wasteful and extravagant but they probably (and rightly) reason that it will cost money as well as effort to abate the evil. What most of them *don’t* realise is that on a justly calculated balance sheet the gain in money alone would vastly outweigh the expenditure, whilst if human welfare as a whole could be as closely assessed, the case for reform—our case—would be quite unanswerable.

We—the elect—of course know that, and I believe it only needs a single sheet of foolscap carrying just the right words and figures to bring equal conviction to everyone else who can read and reason.

Not, of course, that the mere issue of such a proclamation or manifesto or whatever, would of itself and instantly

convert everyone to our own view, though it be the only sane one, for even truth and reason, even plain common-sense, needs salesmanship in this non-sensical world of ours, as Shaftesbury’s fight for the Factory Acts and Willets for Daylight Saving sufficiently remind us.

But even when we have got the legislation that we want and that is long overdue, that isn’t the end of our job by any means—far from it. Plenty of excellent and well-intended legislation has got onto the statute book, lots of good bye-laws have been adopted, that have in fact failed largely of their purpose simply because they have never been actively implemented, chiefly because public opinion has not been sufficiently strongly behind them. I always have a sneaking hope that every body to which I belong may one day cease to be necessary through achieving the object for which it was founded. That may yet be the happy fate of some, but never of this society.

First we must get our National Code—a Chimney Code as clear and compelling as the Highway Code, but then, and for ever after, we shall need to be on the alert to see that its provisions are duly observed. We shall no doubt need to institute competitive regional “Clean the Skies” weeks like “Safety First” weeks or Rat Weeks, and why not a National Badge scheme, where the public is encouraged to buy only (or preferably) such products as carry a stamp certifying that the manufacturers’ works have been duly inspected and approved as conforming to the standard of cleanliness as regards smokelessness required of those thus favourably distinguished?

The pollution of water that *may* be drunk by human beings is very properly considered a highly anti-social action and it is odd indeed that the poisoning of the air that all *must* breathe should be regarded so much more lightly.

Maybe, you will expect me, as an architect, to be especially vehement about the disastrous effects of smoke upon buildings. Well, of course, smoke is quite literally our *bête noire*.

It coats our buildings with soot and a bituminous deposit which ruins the mouldings, and not content with that, erodes our projections til they are apt to look more like decayed teeth than

architectural embellishments.

The Ministry of Health Committee on Smoke and Noxious Vapours Abatement some 20 years ago calculated that six million pounds worth of fuel a year is wasted in England on the production of worse than useless smoke. This was the mere waste of coal, and did not include the cost of extra washing which smoke causes in every town household, or the damage to agriculture, buildings and health. What the calculation would be to-day I cannot even guess.

Experts, factory owners, heating engineers and so forth, seem agreed that smoke prevention is not only possible, even in England, but might well be directly profitable. There are a great many devices on the market for the prevention of industrial smoke; under one system twin boilers are used and coal is burned in one and coke in the other, the coal smoke being blown across the incandescent coke and consumed. In another an oil spray is forced across the top of the fire, and of course now there are the mechanical stokers.

Some, however, maintain that all that is needed are proper training and shorter hours for human stokers. This has certainly been the finding elsewhere. Stoking is a skilled job, but in England, at any rate, the stokers—all except the head men—are often completely unskilled. They work very long hours, moreover, and are naturally tempted to stoke seldom and excessively, with the natural result that their spasmodic ministrations are proclaimed by billowing clouds of poisonous smoke.

Of course apart from the increasing use of gas and electricity, one of the most hopeful prospects in the clean air campaign is the probable wide adoption of "District Heating," either by steam or hot water—an exceedingly economical modern technique of central servicing already well tried out in Russia and America and obviously the thing for our more densely built-up city areas.

Unfortunately there seems to be no limit to the squalor that humanity will put up with in its ruthless, joyless, industrial towns, but there is a quite definite limit to the pollution of the air and the denial of sunlight below which life itself is not only prejudiced

but actually endangered. Thus quite apart from any reasonable human desire to live a little less ungraciously than is possible in the nastier of our towns, the very urge towards mere biological survival as an animal is forcing people out into the surrounding country.

In so far as the country is sought for its own delights, the instinct is clearly right and laudable; but in so far as it is colonised by refugees fleeing from intolerable towns, who have no natural instinct for country life, but who elect to live there as it were negatively and under protest, for the sake of their own and their children's bodily and spiritual health, the movement is calamitous.

The social and cultural amenities of a civilisation can only be enjoyed to their full in a community—a community of a certain size and compactness, that is, in a town; and no matter to what extent transport and communications may be improved, the towns still remain essential to civilisation and the good life.

Thus the existence of smoke has obviously an indirect as well as a direct effect in the progressive destruction of the countryside and is a chief agent in the failure of our towns to provide what only they could provide, and that is optimum conditions for fully civilised living.

Even a generation ago, even a decade ago, we were in nothing like so strong a position as we are to-day to press for smoke abatement on a really drastic scale.

Of course a better educated public opinion is now strongly with us, thanks largely to our own unflagging educative efforts, but, even more potent, technological advances have lately been such that our demands, once regarded as amiably impracticable, are now accepted as just plain commonsense and entirely in line with the most enlightened and up-to-date industrial practice, where fuel efficiency is as much a matter of pride as of profit and where a foul aerial effluent from a chimney is considered as wasteful and anti-social as the contamination of a river by foul effluents from a sewer.

There is a Pure Rivers Association that has taught better manners to sewers. We, teaching civilised deportment to chimneys, are its big brother

of the skies. We are allies, and until we have together won our war on all fronts—

“The dream of London white and clean,

The clear Thames bordered by its gardens green.”

will remain a dream, and no more.

So to Hell with all smoke—where it belongs ! Forward !

The paper was received with acclamation and it was proposed by Mr. Charles Gandy, and unanimously agreed, that an expression of the cordial thanks of the meeting be forwarded to Mr. Williams-Ellis for a brilliant contribution.

The Chairman then called upon Mr. Gandy, as Chairman of the Executive Committee, to present the following statement on behalf of the Committee.

STATEMENT ON BEHALF OF THE EXECUTIVE COMMITTEE

IN many diverse respects the plans now being drawn up for post-war reconstruction and development—townplanning, housing, new building, industrial re-equipment, and fuel utilisation—create a unique opportunity for the inclusion of measures that will either prevent smoke and other forms of air pollution or provide the means for their progressive abolition. Unless, in good time, the possibilities of smoke prevention are considered and integrated into these plans, this opportunity will be lost, and the post-war years will see the unnecessary creation of new sources of smoke as well as the equally unnecessary continuation of smoke emission from existing sources.

It is therefore imperative that every effort be made, and made now, to ensure that full cognisance of the problem is made by Government Departments and Committees, and others, dealing with subjects into which enter either smoke prevention or the consequences of smoke.

The National Smoke Abatement Society has already made a series of proposals that have been published in the form of a printed memorandum which has been submitted to the Departments concerned. Proposals relating to domestic smoke prevention have been amplified in a further memorandum submitted to the Design of Dwellings Sub-Committee of the Ministry of Health. It is not necessary here to recapitulate in full these proposals or the arguments leading to them, but for convenience the more important points may be summarised :

(1) With respect to fuel-burning

appliances in all premises other than domestic : All new plant and appliances and alterations should be required to receive the approval of a competent authority with regard to efficiency, suitability, and smokelessness before they are installed. In many industrial plants this will not end the possibility of smoke, and further control may be required, but in what are termed “commercial premises” (e.g., offices, hotels, etc.) automatically smokeless installations can be readily ensured and should be made obligatory.

(2) With respect to domestic smoke : given requisite attention in good time for planning the increased production of the smokeless fuels, mediums and appliances required, all post-war housing can be made entirely smokeless. It is maintained that this reform, considerable though it is, is feasible and will in more ways than one be advantageous to the national well-being. In the event, however, of it not being completely attained from the beginning, then it may be urged that not more than one open fire should be permitted in each house and that this should be of the most modern and efficient type available and capable of burning any form of smokeless fuel without structural alteration. Apart from direct methods for smoke prevention much-needed improvements in the standards of domestic heating can be attained and will lead to a greater efficiency of fuel utilisation.

(3) Central or other suitable areas in all large towns should be scheduled to be rebuilt only with smokeless methods,

so that at an appropriate date they may be declared to be smokeless zones. These smokeless zones will eventually include the whole of each town. This further stage is embodied in the Society's "Ten Year Plan."

(4) Since the Memorandum was printed a further proposal of importance has been made and it may be convenient to quote this in full :

"The establishment of local or regional authorities for the approval of installations will require some form of national co-ordination to secure uniformity of practice and the dissemination of new information, particularly on technical advances. The control organisation required could appropriately concern itself with the task of surveying the sources of pollution with a view to establishing the responsibility of each type of source, both with regard to the quantity and nature of emission. Such work, designed entirely from the preventive standpoint, could be associated with the promotion or co-ordination of researches designed to prevent such pollution or with ensuring that the use of new methods and techniques resulting from research is made known to and encouraged by the authorities dealing with new installations and alterations."

The Society's further proposals, termed the "Ten Year Plan" do not directly concern the particular subject of this conference, for they relate to a time following the immediate post-war period of new building. Until this first period is concluded, fuels and appliances will not be available for a large-scale change-over of existing premises to smokeless conditions. The Ten Year Plan has, however, one important bearing upon the problems of immediate reconstruction. It demonstrates that the measures to ensure smokelessness in new premises are not to be regarded in isolation from what now exists, and that they are in fact the first stage of the more extensive plan that will have for its purpose the complete abolition of smoke from all our towns. Without such understanding it might, to some, appear to be of little value whether the new premises (which will usually be among or adjacent to existing premises) are smoke-

less or not. The Ten Year Plan is the logical and necessary sequel to the proposals for the first stages of reconstruction, and if such a plan can be shown to be practicable and desirable then there is all the more reason for achieving the preliminary stages.

The Society's proposals have had some publicity and have received resolutions of support from over eighty Local Authorities, including most of the larger cities and boroughs. They are nevertheless, in some respects, still in the embryo stage and need further examination and amplification. In particular the practical measures required to translate them into actuality need to be propounded in the form in which we can reasonably expect them to be incorporated in legislation.

This conference has therefore been called to initiate the further discussion required and to learn directly the views and suggestions of members of the Society and of the representatives of the Local Authorities who will be directly concerned with the practical application of the new measures.

Although the Executive Committee does not wish to restrict the scope of the discussion it is hoped that this may be directed to the immediate subject of the conference, and suggests that in particular attention might be given to the following points :

- (1) The nature of the regulations required for the operation of the proposals relating to the pre-installation approval of new plant and appliances.
- (2) The form of organisation required for this purpose, e.g., local or regional; qualifications of staff, etc. The form of the national co-ordinating body also recommended.
- (3) The legislative questions affecting the establishment of smokeless zones.
- (4) The problems of application of smokeless zones in specific instances.
- (5) The domestic problem: the attainment of complete smokelessness in post-war housing, and, in the event of failure to secure this, the secondary policy to be advocated.

- (6) Ways and means for developing and advancing the agreed proposals of the Society.

Some References

Memorandum on Smoke Prevention in Relation to Initial Post-War Reconstruction (*N.S.A.S.*, 1942).

Memorandum on Design and Equipment in Post-War Housing, in Relation to Smoke Prevention (*Smokeless Air, Autumn*, 1942),

Plan for Clean Air (*N.S.A.S.*, 1943).

The Provision of Smokeless Fuels, by Dr. G. E. Foxwell (*Smokeless Air, Summer*, 1942, and *Journal Inst. Fuel*, XVI, No. 87, Dec., 1942).

The Cost of Abolishing Smoke, by J. Patrick (*Smokeless Air, Winter-Spring*, 1943).

Smokeless Zones (*Proc. Leeds Conference, N.S.A.S.*, 1937, *Smokeless Air, Summer*, 1941, *Autumn*, 1943, etc.)

In view of the shortness of time before the lunch adjournment it was agreed to consider a resolution proposed by **Mr. JAMES LAW** (Sheffield, Rotherham, and District Smoke Abatement Committee) on the question of the present situation with respect to smoke emission. Mr. Law said:

You have heard about the ostrich who "buried his head in the sand on the approach of his enemies" and you have probably heard about the country that tried to hide from its enemies by covering its cities and towns with smoke. Whether this served any useful purpose the historians may be able to tell us in a couple of generations, but the cost in fuel must have been tremendous and will never be assessed.

Later came a fuel shortage and appeals were made for greater fuel production and economy in use. The natural sequence to this should have been the rescinding of the order, but it was not thought necessary or expedient to do so. It was also thought that the quickest and most practical method of economising in fuel would have been to insist that chimneys should not emit excessive smoke, but in this there was again disillusion. Bulletins were issued on the construction of steam flow meters, the insulation of pipes and the systematic

measurement of coal, but practically nothing on heat losses occasioned in the boiler flues and flue gases where the greatest waste can occur.

Discussions have taken place on Post-War Reconstruction and Planning, but when a dispassionate review is made of the situation it would appear to be futile to make plans until the present obscure situation is cleared up.

Is there to be any control to prevent the present waste of fuel? Are there to be any Enforcement Officers to insist that reasonable combustion conditions are in operation?

I have been a Combustion Engineer for over 30 years both ashore and at sea, but I have never seen conditions worse than those in the industrial cities and towns of the north during the past two years and I think other delegates from the north will agree with me. Our statistics show an increased pollution figure of over 50 per cent. in the industrial area, but observations show that excessive smoke emission is approximately seven times as great as in 1939, the deposit being carried by the wind for many miles into the surrounding districts.

I am going to put a resolution to this Conference, which I hope you will all support, as follows:—

"That this Conference of the National Smoke Abatement Society representing 130 local authorities views with grave concern the increased atmospheric pollution, particularly in the industrial towns of the north and requests the Minister of Fuel and Power to take such action as he thinks necessary to obviate this waste of fuel as quickly as possible."

A number of speakers supported Mr. Law, and representatives from the South and Midlands affirmed that the conditions he had described were not peculiar to the North of England. **Councillor J. COOT** (Ebbw Vale) spoke on the question of a serious dust and grit nuisance experienced in his district and described some of the effects of this upon the homes and people suffering from it.

It was agreed that consideration of the resolution should be made at the time of, and in relation to, other resolutions that would be considered at the end of the afternoon session.

The Conference then adjourned.

Afternoon Session

Chairman : Mr. Charles Gandy

The Chairman read an apology for the unavoidable absence, because of Parliamentary duties, of Mr. E. H. Keeling, M.C., M.P., who was to have presided at that session. He then called upon the first speaker in the discussion.

Miss ELIZABETH DENBY said she was appalled to see how smoke was drenching the countryside more and more each year. She did not think the Executive's statement went far enough, and suggested the Society's name might well be Smoke Abolition Society and not Smoke Abatement Society. The Statement did not hold out any immediate prospects of dealing with the smoke nuisance. Four and a quarter million houses were built before the war, and only 100 of them were completely smokeless. Local Authorities should make the abolition of smoke one of their prime duties. Women would endorse the statement that homes should be smokeless, but would always want an open fire. Attention should be turned to the manufacturers of heating equipment, who should be encouraged to produce attractive equipment for the burning of smokeless fuel in open grate.

Miss CAROLINE HASLETT (Electrical Association for Women) stressed the importance of the opinion of housewives. More women's organisations than ever had recently sent in suggestions on housing and similar problems. A Standing Joint Committee of Women's Organisations had been formed to study civic and national problems. The co-operation of these organisations should be enlisted in the fight for smoke abatement.

In wartime, continued Miss Haslett, everybody was more concerned than ever about housekeeping, and one was doubly conscious of anything that accentuated these difficulties. We had less time, less soap, and no hot water to waste if we were economising in fuel. It was therefore extremely aggravating when one had kept one's own house clean to have to battle with the dust and smoke from someone else's

chimney. It should be as great an offence to make other people's houses dirty as it was to deface their property.

If something was not done about it the beautiful new buildings of the post-war cities would become begrimed and as bad as their sooty predecessors. We were willing to put up with drabness in wartime, but were all longing for cleanliness and colour and freshness in the post-war world. In post-war building flat roofs and sun gardens were to be expected. But what use would they be if they were covered with dust and smuts? We were expecting more open spaces, more gardens and green belts in cities, but Miss Haslett believed that although the nitrogen was there the pores of the poor plants became so clogged with soot that they could not absorb it.

Dr. R. LESSING said that what the Society was really after was local or regional clean air, and he would prefer to have a "Clean Air Society." The pollution of the air was caused not only by the visible smoke, but also by the acid gases which were generated by the combustion of such fuel as raw coal, and the damage was mainly done by the invisible sulphur gases. The emission of visible smoke had diminished in the last thirty years, but it had been replaced by the emission of grit and dust by factory installations.

We were in a position to-day to say that the technical problems had been solved, and this had been done on a large scale at the power stations at Battersea and Fulham. Forty million tons of coal were being burned a year in the home and small industrial premises, and the replacement of this by a smokeless fuel was a formidable task and could only be done by the technicians and by the sympathetic support of the Government or authority who had to countenance the change.

Mr. V. W. DALE (British Electrical Development Association) said :

Unless I am extremely careful there is a risk of merely repeating many of the

things that have been said already, here and elsewhere, by more able contributors: there is little or nothing new that can be said at this time about the evil effects of smoke and polluted atmosphere both on persons and property and perhaps little purpose can be served at the present time in staging another "indignation meeting" demanding some speeding up of smoke reform by Authority.

In the United States the miners seem to be lending a hand in the abatement of smoke: over here fuel economy and all the action that is being taken to improve combustion and efficiency—particularly in industry—is no doubt making its influence felt on the smoke nuisance.

I am sure nothing I say will be construed as propaganda for anything but smoke abatement although you will expect me to say a few words about the industry with which I am associated.

Looking ahead into the immediate post-war years I suppose there are few things which can contribute more to the Society's objects than the spreading of the use of electricity and gas and the further development of improved coal burning grates and furnaces of all classes.

As regards Electricity: since the work of this Society commenced many years ago two or three notable events have occurred which contribute notably to its objects and which reflect further contributions after the war.

First: the per capita consumption of electricity in this country ten years before the present war was ten times greater than it was ten years before the last war. But, at the outbreak of this war the per capita figure was actually forty times greater than it was at the beginning of the century. The extent to which this normal development of a commodity which, when used as a fuel, is smokeless both in distribution and at the point of its application and use—needs no comment.

Second: technical improvements have brought about a great reduction in the amount of coal needed for each unit generated with the result that whereas twenty years ago one ton of coal produced eight hundred units, to-day the most efficient generating stations produce three times that number of units.

Third: Concentration of electrical generation in a lesser number of highly efficient selected stations is, in itself, again another vital contribution to the reduction of the smoke evil.

These thoughts at once link up with post-war considerations. If we visualise development over the last twenty years and note particularly the nature of the curve in the last decade I think it will be readily seen that the destiny of the Electrical industry and the gradual and ultimate achievement of the objects of the Smoke Abatement Society run very much in parallel.

But there are some disquieting symptoms.

"Smoke is money"—if that is true, or if at least true by influence, we all know that as soon as hostilities cease Britain will simply be compelled to seek export markets—old and new—and she must again be at least *one* of the principal workshops of the post-war world.

In order to make as sure as possible that there is no calamitous reaction on smoke abatement it appears to me that the Society should direct our attention urgently to three things—Press—Politics—Planning.

(1) *Press*. We need a much better public knowledge of the dreadful ravages of smoke—I need not recite them. At this Conference we are preaching to the converted. We should, in my opinion, start right away to persuade the Press that smoke abatement is not a novelty or a fad—but that it is continuous news.

(2) *Politics*. We should watch out for every opportunity to promote legislation which will tend progressively to reduce to an absolute minimum, emissions of smoke in densely populated areas, particularly from the domestic chimney.

(3) *Planning*. We must see to it that there is no cheese-paring in the provision of smoke reducing appliances and, equally important, in the use of heat insulation materials in the ten-year four-million-houses Government plan.

I cannot tell you in any great detail what measures are being taken by the electrical industry, mainly for the reason that during the last three years or so we, in common with our contemporaries in the fuel industries, have been making an effective contribution to smoke abatement by appealing to the

consumer day in and day out to *use less fuel*. I am glad to say that there was a good deal of evidence last winter to show that the consumer responded—we are not quite so sure what he is doing about it this year.

Apart from that our manufacturers, almost without any practical exception, have been engaged on high priority war work and have had little or no time for post-war problems. But I can say that plans are being formulated for the production of electrical appliances the use of which must have an over-all effect of contributing to a solution of the menace which is the single concern of this conference.

I would like to mention one other thing: we have recently developed and have ready to demonstrate to the Minister of War Transport a National Standard Electric Vehicle. Mr. Noel Baker has prophesied that in five years after the war the number of motor vehicles on the road will be quadrupled, the meaning of that statement in regard to atmospheric pollution is pretty obvious.

My Association, the Electric Vehicle Association, believes that in the "Electric" we have an effective answer to this side of your problem.

The electric vehicle attacks the worse offender on the road because of its special suitability in urban areas where traffic density and slow movement increases the peril. May we also hope—indeed the last few days have produced some reason to hope—that there will be a rapid speeding up of *railway electrification* in the immediate post-war years.

I hope also, we shall not overlook the need to keep the insides of our homes free from dirt, and dust, and smoke.

Where do we go from here: I don't suppose the Smoke Abatement Society is wondering what to do at the next immediate stage, but I would like to suggest that it might well devote itself first to these three things:—

(1) To lend its support wherever it can to secure better heat insulation in new housing design.

(2) To amplify that aspect of abating a nuisance which can express itself in saving, or reducing waste—whether it be fuel, spoilation of property or menaces to health. In this way the Society will be keeping a place for itself in a post-war world where waste

will perhaps be a sin.

(3) To widen the scope of the Society's work from abating smoke to abating dirt and promoting air purification and air conditioning generally.

I agree that some of these activities may tend to overlap with similar activities by other bodies. Some day perhaps all these things will be federated and the work divided out—but for the moment, perhaps they are more healthy for being independent and we are gaining more than we are losing through duplication.

In conclusion, there comes to my mind two lines from the sonnet "On Westminster Bridge." It runs, I think: "Ships, towers, domes, temples and theatres lie
all bright and glittering in the
smokeless air."

Not only Westminster—we want to see Wapping and Wolverhampton and Wigan . . . "all bright and glittering in the smokeless air" . . . I am sure I can promise this conference, Mr. Chairman, that the electrical industry's plans for, and contribution to, post-war reconstruction are very definitely and closely allied to that objective.

Dr. J. JOHNSTONE JERVIS
(M.O.H., Leeds) said:

The truth is that smoke connotes waste, waste of fuel, waste of money, waste of all that is beautiful in architecture and in the countryside around our cities, waste of human health and life. That being so our duty is plain and it is to get rid of smoke. We have tried compromises and they have failed. For the last twenty years of my public life I have been struggling with the problem, suggesting this remedy and that and all to no avail.

As regards industrial smoke there has certainly been some improvement but in domestic smoke progress has been lamentably slow and there is very little to show for all our efforts.

How long must we continue trifling with the problem? Has the time not come when in the interest of national economy and public health we must get down to the root of the trouble, which is the burning of raw coal? Viewed from whatever angle, to burn coal in its raw state is no longer justifiable seeing that there are available so many satisfactory substitutes which give the same result with none of the concomitant

evils. The only way to achieve this purpose, in my view, is to prohibit the use of raw coal altogether except where it forms part of an industrial process and there is no satisfactory alternative.

That, it may be thought is a counsel of perfection and too utopian. Nevertheless, I make the suggestion fearlessly in the full conviction that it is the only way to reach the goal we are aiming at which is a smokeless atmosphere.

The time for palliatives has gone. We must now determine on a radical cure, and I seriously suggest to this body that its policy in future should be the abolition of smoke and not merely its abatement.

Mr. J. W. BEAUMONT (Chairman, West Riding of Yorkshire Regional Smoke Abatement Committee) said :

Industrial premises : Since the passing of the Public Health (Smoke Abatement) Act of 1926, the provisions of which are now incorporated in the Public Health Act, 1936, I think it will be agreed that there has been a steady, although slow, improvement in existing fuel burning appliances. In addition, to this there has been an increasing use of electricity and gas in the production of power. We are, I think, justified in thinking that these improvements and conversions will continue in the post-war period. Our main consideration, therefore, should be given to the subject of the installation of new plant and appliances in the first place, and secondly, any action we can take to deal with obsolete plant which cannot reasonably be adapted to consume its own smoke.

What competent authority can be set up to deal with those matters? Should they be local or regional? What form of national co-ordination can be devised to secure uniformity of practice and dissemination of information on technical discoveries and advances?

In recent years we have heard much of the necessity for a National Fuel Policy to conserve our natural resources and—more important still—to obtain the maximum benefit from these. This is obviously a matter for the Ministry of Fuel and Power. This body should provide the necessary co-ordination and disseminate information of scientific and technical importance to any regional authorities that may

be set up and local authorities. It is questionable whether there would be any need for a regional authority to deal with the matters mentioned, provided local authorities availed themselves of their opportunity to set up a competent authority.

In this connection the action taken by Manchester is worthy of note and commendation. There has, I understand, recently been formed a Committee to be known as the Smoke Abatement and District Heating Technical Committee. Included in its members are the City Surveyor, City Architect, Housing Director, Gas and Electrical Engineers, Chief Sanitary Inspector and representatives of the Heating and Ventilating Engineers. It is difficult to imagine a more competent authority to approve the installation of new plant and pass judgment on the obsolete.

Commercial premises : This term includes all offices, warehouses, hotels and other non-industrial premises, excluding dwelling houses. Here there are no particular difficulties since there are to hand the means for making them all smokeless in operation. For a commencement, however, and as a prelude to any general compulsory measures which may be found necessary, the establishment of smokeless zones is a procedure which has much to recommend it. It is the "bridgehead," so to speak, from which the area of smokelessness can be extended until it comprises the whole. The power of example is great, and here again it is obvious that the Government should take the lead by ensuring that all premises over which it has jurisdiction, should be rendered smokeless. With such an example—or even without it—local authorities should take similar action which should precede any request for additional power to establish smokeless zones.

Under Section 47 of the Public Health Act, 1936, a local authority may pay part of the cost of conversion of closets to water closets. If this was considered to be necessary, why should not a grant be paid to those who, by carrying out the necessary work, cease to pollute the atmosphere by the emission of smoke? The local authority and the community at large would derive great benefit thereby.

Domestic premises: The provision of sufficient houses to replace those demolished as the result of enemy action, to meet the deficiency which has accumulated during the war years, owing to the cessation of house building, and to complete slum clearance and overcrowding schemes, will provide the greatest problem of post-war building.

It is a well-known fact that domestic smoke forms no small part of the general pollution of the atmosphere. Indeed, many people are of opinion that it forms the greater part. In any case it is obvious that, before complete smokelessness can be achieved, the problem of domestic smoke has to be dealt with.

Whatever opinions one may hold as to the wisdom of attempting by legislation to force a reluctant majority of householders to cease burning bituminous coal in an ordinary fire grate, it will, I think, be agreed that in the case of new house construction of the magnitude required, it would be utter folly if we did not take advantage of the opportunity to see that as far as possible such houses should be smokeless. To this end all possible steps should be taken to substantially reduce the cost to the user of gas and electricity, and special grates should be provided to burn solid smokeless fuel where such are necessary. The fullest advantage should also be taken of central heating where such can be advantageously applied, and the possibilities of district heating should be fully explored.

As rehousing measures will be very largely the concern of local authorities, there should be set up an adequate committee to deal with the matter, on the lines of the Manchester committee, whose duty would be to ensure that in all local reconstruction work the question of smokelessness would receive due consideration.

Where special grates have been provided to burn solid smokeless fuel, it should be made an offence if such are used for the burning of bituminous coal. At a later stage, when we are assured that there are adequate supplies of smokeless fuel available for all our needs, any legislative steps necessary to ensure its proper use could then be taken.

Propaganda: Despite the fact that the

evils of atmospheric pollution by smoke is daily before the eyes of our people—especially those who live in industrial and urban communities—it is unfortunately true that in the main they do not recognise these evils or realise that they are preventable. Definite steps, therefore, should be taken to provide a wider instruction of the public in general and schoolchildren in particular, in methods of healthy living with reference to atmospheric pollution.

Mr. F. J. REDSTONE (Chief Sanitary Inspector, City and County of Bristol) said:

I have listened with great interest to the paper we have had this morning, and to the other speakers in the discussion this afternoon, and one thing particularly pleases me, and it is that the National Smoke Abatement Society is now widely enlisting the help of practical people in formulating plans for the future. Old-fashioned, filthy and wasteful methods of heat production, whether it be for industrial or domestic purposes, must be swept away. Science has provided the methods whereby this can be done, and we are now co-opting the sympathies of people who know how to do it.

At the present time the law recognises that the methods in general use cannot be worked without nuisance, and it was encouraging to hear the City Engineer for Bristol state at a recent re-planning conference that the problem is a serious one, and that more attention should be given to it.

There is one important point in connection with new and smokeless methods that I would like to emphasise. It is not a bit of use appealing to the housewife to use smokeless fuels that cost more money than coal, whatever our arguments the housewife places initial cost first, and for that reason I hope there will be adequate control regarding prices of new fuels or old fuels used under new methods.

To those of us that live in what people are pleased to term a reasonably clean town, I would say do not let us be satisfied with a reasonably clean town, but strive to establish a really clean town. I am quite sure that this Society is doing a great deal to attain that end.

Councillor Mrs. ALDERSON HORNE (Westminster) said :

I am an advocate for the retention of one open fire in every house. The open grate not only warms the air but ventilates the room, and psychologically it cheers and soothes nerves.

Smokeless coal should be used—the criticism of it is that it is costly, but this is generally owing to the fact that it is being wrongly treated. We should play fair and give it its chance, for it is the faulty stoking and the ill-adapted grate which make it burn away too fast and so become an extravagant luxury. Cannot a grate be put on the market with a solid bottom, thus giving less draught, and with vertical bars in front to ensure that ovoids does not roll through and out ?

In my little two-hundred-year old house in London I experimented with every make of smokeless fuel then on the market, and the most successful was burnt in the old grate into which I had fixed a solid bottom—I used 23 or 24 pounds, including the laying and lighting, in a day of fifteen hours, and with coal costing at that time 55s. a ton I calculated that my fire cost me 4s. 1d. a week. In that I had real warmth in my room, which measures 18 by 16 ft.

Mr. LESLIE HARDERN (Gas Light and Coke Company) said :

I propose to talk about the open fire as this appears to me to be the biggest single problem facing us.

I do not think it is generally realised, and many people have expressed surprise when I have told them, how many smokeless solid fuel open grates were being installed in houses and flats in Greater London just before the war. The number had risen in a few years to the surprising peak of 150,000 grates a year. Moreover, all these grates were being sold without any advertising or sales pressure—simply by personal recommendation. Bearing in mind that they were early models, and that very considerable progress has been made since 1939 in the design, draught-control and flue construction of these smokeless grates, one could imagine an intensive educational campaign after the war resulting in the installation of some 300,000 to 400,000 smokeless fuel grates a year. In other words, smokeless

fuel grates would be installed in all the homes in Greater London in some five to seven years.

Having painted this very attractive picture, I must now describe the seamy side. A very large number of these smokeless grates are being used to burn—not the smokeless fuels for which they were intended—but raw coal. In view of the great importance of this problem, I have recently been carrying out some investigations in London, as far as wartime conditions permit, to find out why people are using raw coal in these grates. The main reasons given are (1) liking for the flames of a coal fire, (2) fondness for poking and breaking the burning coal, (3) variations in the qualities of smokeless fuels, (4) need for more frequent stoking, (5) inadequate storage space for the extra bulk of smokeless fuel, (6) difficulties in obtaining deliveries as compared with coal, (7) the high price of smokeless fuel compared with raw coal.

Some of these are wartime difficulties. For instance, variations in smokeless fuel qualities unavoidably follow variations in the qualities of coal deliveries ; many people have been registered with coal merchants who could not supply coke, and dual registration has only recently been permitted ; official price regulations have resulted in greater increases in coke than in coal prices.

Two other difficulties can be overcome in post-war reconstruction. Adequate storage space for smokeless fuel can be made an essential of new houses and flats. The new smokeless fuel grates, with their greater control of speed of burning, reduce stoking periods.

The remaining difficulties—the longing for flames and poking, can only be overcome by continuous and persistent public education on the lines advocated by this Society.

I am confident that when the war is over the right equipment will be available—smokeless fuel grates of good design in coloured enamel, with precision-control of burning, simple ignition by gas instead of paper and wood, inexpensive to supply and instal.

The right equipment, however, is not sufficient. Unless we make sure that we get uniform qualities of smokeless fuels, prompt and regular deliveries, adequate storage space, and above all, prices which do not exceed the prices

of raw coal, we shall not solve the smoke problem of the domestic open fire.

Alderman J. J. MILTON, J.P. (Chairman, Bristol Health Committee) said :

Whilst Bristol is not a centre of heavy industry the Health Committee is alive to the smoke problem, and with the object of establishing a cleaner atmosphere in the area, the Bristol and District Regional Smoke Abatement Council had been formed. The work of this Committee has been seriously curtailed due to war conditions, but it was hoped that further meetings would soon be held with the object of continuing the good work already started.

A great deal had recently been heard about district heating, and at the present time Bristol was seriously considering such a scheme—I believe the first to be submitted in this country. The scheme before the citizens of Bristol was a “heat distributive scheme” which would cover an area of approximately 345 acres in the centre of the city. It was costly, with an estimated expenditure of over a million pounds and at the present time the Bristol Corporation was in no way committed to it; but taking the long view there was no doubt it had great remunerative possibilities apart from its amenity value. The scheme was much in line with the Society’s suggestion of creating a smokeless zone.

Mr. EDWARD ROBINSON (Sanitary Inspector, Houghton-le-Spring) said that the Society should urge the Government to take action regarding the nuisance arising from colliery spoil heaps, having regard to the fact the heaps were being increased in height by the new process of depositing refuse. As the majority of houses in a mining area were built within easy reach of the pitheads, it was quite easily understood how these high unsightly heaps were depleting light and breathing space of the people living in such houses. As smoke and fumes nuisances from the heaps affected the public health and well-being of the local inhabitants, the Government should consider post-war schemes to abolish this nuisance for all time.

Councillor the Rev. R. BURGESS (Beckenham) urged that the Society, in extending its propaganda, should make more use of the parsons. Parcels of literature should be sent to them and they should be asked, not to give lectures on the subject, but to introduce it into their sermons. There were plenty of texts in the Bible on health and cleanliness. Another body of people who would be sympathetic towards the Society’s aims would be the allotment holders, whose labours were often spoiled by the smoke nuisance. He suggested that their national association be approached.

Dr. G. E. FOXWELL said :

It appears from the discussion that many members are not acquainted with the work that is being done by the Fuel Efficiency Committee of the Ministry of Fuel and Power. As this work is of great importance in the abatement of industrial smoke it is well that something of what is being done should be put on record. The Fuel Efficiency Committee was set up some two years ago when the need for saving coal became apparent. The Main Committee is composed of men of wide experience in all the fuel industries of the country. It has several sub-committees, one of which for example deals with education, and another with technical matters. The Education Committee, for example, has been running a great educational programme in fuel technology for works engineers, stokers and others. Already some ten thousand people have attended these courses. The Technical Committee has issued some 30 bulletins to assist in the better utilisation of fuel. The Trade Association Sub-Committee has enlisted the co-operation of all the important fuel using industries in the country, most of whom have set up their own fuel efficiency committees to deal with their own problems. I would point out that the great improvement which is now being made in the technical use of fuel and the great increase of knowledge on the part of those who are responsible for works boilers and furnaces must change the situation very vitally. If fuel is burnt efficiently and if appliances are maintained as they should be, the production of black smoke in industry will auto-

matically cease. I am sure that the Ministry of Fuel and Power will be very responsive to any suggestions that can be made by the Society to this end.

The general problem of smoke abolition has three facts: (1) Political, in the acceptance by Parliament and by local authorities of the need for legislation to further the cleansing of the air; (2) The acceptance of the programme of the Society by the nation in general; this is primarily a propaganda and educational programme, and, of course, if it is successful the political programme is made easier; (3) Technical considerations to which (1) and (2) must be subservient because it is no use advocating policies which cannot be put into effect for technical reasons.

I should like to make the suggestion that the Society should set up three distinct panels. A political panel, which would of course include all Members of Parliament who are members of the Society, a publicity and educational panel (the suggestion made by the Reverend R. Burges that the Church might be persuaded to take a hand in the work of the Society would come within the purview of this Committee), and a Technical Committee which would consider the technical aspects of smoke abolition in all its many angles. It has often seemed to me that in view of the widely diffused interests of members of the Society some crystallisation of effort and some authoritative body to which important questions can be remitted, is desirable.

It is on the technical aspect of the subject that I wish to speak. Complete abolition of even a light smoke haze is not always possible in an industry if raw coal is to be burnt efficiently. When chimneys are sufficiently high this may not be a matter of any consequence but observation has shown me how a town of some size can blot itself out to an observer on a neighbouring hill by the production of light smoke haze and without any single chimney producing black smoke. In the light of this observation I would urge that the Society must stand for *complete* abolition of *domestic* smoke. This means that it is not possible to allow one raw coal fire per house (few houses burn more than one fire at a time, anyway) and it means that it cannot be permissible to permit grates

which only reduce the present amount of smoke. These are palliatives and not a solution. It is necessary if the ultra-violet rays are not to be cut off to insist absolutely on the use of smokeless fuels for domestic purposes.

One of our principal problems to-day is coal conservation. The present position of our coal supplies is such that we are already facing the exhaustion of our best seams and that within the lifetime of many of those present we shall be driven to deeper or more expensive or inferior seams and we shall be in a much worse position in this respect than either Germany or America. I need not remind you what this will mean to our industrial position. The problem of smoke abolition must therefore be viewed against the wider problem of coal conservation.

From the angle of coal conservation it is indefensible to use electricity for domestic heating, unless some means, such as district heating, can be found for raising the thermal efficiency of electrical generation to about 50-60 per cent.

Including the various transformer and distribution losses, 1 ton of coal produces some 1,400 units at the consumer's appliances, and even if this is used with an efficiency of 100 per cent. the efficiency is only 17 per cent. or 48 therms per ton.

Compare this with modern carbonisation practice (Table I).

The high efficiency makes for cheaper fuel, as well as smokeless fuel. The first step, therefore, is to popularise the use of the products of carbonisation for domestic heating purposes. All is not well in that direction because in the North there is difficulty in many regions in selling coke for domestic purposes, largely because the domestic hot water boiler, coke-fired, has not been popularised as it has in the South.

There has been something lacking in the approach, and the difference between the North and the South indicates that preaching smoke abolition is not enough; we must decide in what way we are going to abolish smoke and prove to the people that the means that can be provided for the purpose are satisfactory, clean and cause them no inconvenience.

Much good could be done by the propaganda of the Educational Com-

TABLE I (based on coal of 300 therms/ton)

	<i>Therms made</i>	<i>Fuel used in</i>	<i>Eff. %</i>	<i>Therms used</i>	<i>Fuel used in</i>	<i>Eff. %</i>	<i>Therms used</i>
Gas ...	75	Gas fire	50	37.5	Gas fire	50	37.5
Coke ...	145	Convection open fire	65	94.3	Closed hot water boiler	80	116
Tar ...	20	Steam boiler	70	14	Steam boiler	70	14
Total	240	...	...	145.8	...	...	167.5
Efficiency	80%	...	...	48.6%	...	...	55.7%

mittee which I have proposed. In the South we have already discovered that a domestic coke boiler will heat a kitchen and maintain constant hot water day and night and that a gas cooker is the ideal method of cooking. A combination of these two will virtually solve the domestic smoke problem for most houses because it is also possible to open the front of the domestic coke boiler in order to make it into an open fire. In the North, however, this solution does not appear to have been brought adequately before people with the result that it is much more difficult to sell coke for domestic consumption.

I have analysed elsewhere the quantities of smokeless fuel required and how this fuel is to be produced. (See *Smokeless Air*, Summer, 1942, and *Journal Inst. Fuel*, XVI, No. 87, Dec., 1942). The general effect is that if we relied upon new construction to produce the necessary coke and gas we should have to multiply the gas industry $1\frac{1}{2}$ times. This of course would cause enormous capital expense and would take some time, but no industry objects to expansion if it can sell its products.

By taking advantage of the renewals of coking and gas plants that must follow the war we can find about half the heat without increasing our existing capacity, and with very considerable additional saving in coal. The other half would come from new construction. This must take some time, but there should be no difficulty in providing what is necessary, *provided that we are told before the reconstruction period starts that there will be a market for the smokeless fuel if we produce it.*

But the problem will not be quite as simple as that. People who are to use

smokeless fuels must be given fuels that are fully satisfactory. Part of the difficulty is practice; people must learn how to use fuels to which they are not accustomed. It is very difficult to educate people who do not really care whether they learn or not.

The technical men must therefore get busy to make things easy for the user:

- (a) Better appliances for burning coke must be developed. I have some reason for saying that immense advances have taken place in the design of many appliances, and that these appliances will be ready when the works have had time to change from war to peace production.
- (b) Improvements in the quality of coke must be made. The technical basis for this is known, but has not been put into practice as yet except in a few places.
- (c) The same need for improving gas appliances does not exist; great improvement was made in the years between the two wars.
- (d) A really difficult matter is the balancing of the demand for coke and gas. Coke can be stored; gas can only be stored for a few hours. Thus unless coal is to be wasted, we must not make gas that cannot be used within 24 hours; and we must not make coke that cannot be used within a year or so. The essential difficulty of this problem is to replace a fuel that can be stored indefinitely by two fuels produced simultaneously, one of which cannot be stored.
- (e) One solution of this problem is the total gasification process now being developed by the gas

industry; this would allow gas to be made without making coke, but not vice versa.

The general conclusion is that whilst technical arguments point to carbonisation as the most satisfactory way to provide the necessary smokeless fuel, the problem of how to do it still requires a good deal of thought, and possibly some considerable changes in technique in carbonisation and appliance design.

Finally, it has been stated by others who have taken part in this debate that the cost of smokeless fuel must not be markedly greater than the cost of the raw coal it displaces. One answer to this is that smokeless fuels (as shown in Table 1) can be used with a much higher efficiency than raw coal and a higher fuel cost may be compatible with a lower total cost. But the most satisfactory answer is the demonstration by the Gas Light and Coke Co. at Kensal House that the whole fuel requirements of a domestic household can be met by gas and coke at no higher cost than by raw coal.

Councillor Mrs. A. A. BARNES (West Ham) said:

One speaker considers that Smoke Abatement should be taken as a subject in schools, and I suggest that the Board of Education might be asked to include it in the curriculum of Senior Schools and Technical Colleges. Technical education is to play a big part in the future of our schools, so in the engineering shops and building schools part of the training could be the right type of machinery to be used for the prevention of smoke.

Prior to the outbreak of war we had in our Senior Schools in West Ham flats which were run by girls taking Domestic Science. Gas and electricity were installed for cooking purposes, and there again the pupils could be taught the right kind of fuel to be used for smoke prevention, stressing it as very largely a matter of health education also. In many of the homes of these girls who took the course the mothers have found that some of their old ideas have been questioned, and that is why I feel these things could be of use in propaganda for the Society.

Mr. JOHN CHARRINGTON explained that he was called to be present both in his individual capacity as a Coal Distributor and as Vice-President of the Coal Utilisation Joint Council, and he wanted to make it plain that the coal trade were seriously interested in the question of smoke abatement.

On the industrial side he referred to the proposal of the C.U.J.C. to establish an Institute of Coal Utilisation Technologists, the function of which would be to supervise the education and training of experts in combustion. It was believed that the Institute was needed both on behalf of consumers who wanted qualified men to supervise their boilerhouse, and by coal distributors who would increasingly need trained representatives to discuss the coal requirements of their various customers. Smoke, after all, represented waste, and Mr. Charrington said that in his opinion waste in a boilerhouse would be watched with increasing care in future.

Turning to the domestic side, he gave as evidence of the interest which coal distributors are now taking in the better use of coal, the fact that they had recently subscribed £20,000 as part of a much larger fund which had been raised by colliery owners, appliance manufacturers and coal distributors for expenditure upon research into better coal burning appliances. This work had already borne excellent fruit, and a domestic fireplace would soon be on the market which would not only give the housewife infinitely less trouble, but which had already shown that it could reduce a normal smoke emission of $2\frac{1}{2}$ per cent. to something under 1 per cent. and he claimed this as a considerable advance in the problem of smoke abatement.

Mr. Charrington took exception to a remark which had been made earlier in the Conference, claiming that the producers and distributors of solid smokeless fuel had availed themselves of the publicity which the Smoke Abatement Society had given to these fuels to steadily increase their price. This remark was neither true nor fair, as it had to be borne in mind that processed fuels such as high and low temperature cokes cost money to produce, but that the prices at which

they were sold were strictly economical and reasonable.

Mr. Charrington regretted the tendency in the report of the Society to compel people to do this and that, as in his view the people of this country were much more inclined to be led than to be driven. Further, he thought that one open fire in a house was insufficient, and that the Ministry of Health had recommended that there should be at least one bedroom with and open fire in addition to the one in the sitting-room; moreover it seemed unreasonable to stipulate that nothing but solid smokeless fuels should be burnt in these open fires, for it was at least questionable whether a sufficient supply was available.

Mr. Charrington urged a policy of patience, particularly in view of the wonderful results which the Society had already achieved, and reminded his audience that what the people of this country really wanted was an open fire burning bituminous coal, always provided that bituminous coal could be burnt with little or no offence to one's neighbours.

Mr. A. E. MARGOLIS said :

Ever since I have worked in the field of district heating, and especially since I have had the privilege of living in this country, I have stressed the great importance of public heat supply from the standpoint of smoke abatement. It was a great satisfaction to me that district heating was included in your recommendations to the Ministry of Works and Planning, and Ministry of Health. Having now the privilege to speak at this meeting I shall try to show you that district heating is the best method of smoke abatement, in fact of smoke abolition.

The extent of air pollution naturally depends upon the quantity and the quality of the flue gases and the method of their discharge. The quantity of flue gases, when not diluted by excessive air, is in direct proportion to the weight of burnt coal. For the generation of the same heat demand the quantities of burnt coal are in reverse proportion to the thermal efficiencies. Taking, for the sake of simple comparison, thermal efficiencies in round figures, of 20 per cent. for coal fires, 50 per cent. for central heating boilers and 80 per cent. for a district heating boiler plant, the

quantities of flue gases for coal fires, central heating boilers and a district heating boiler plant are in the proportion of 10 : 4 : 2.5.

The quality of the flue gases, from the standpoint of air pollution, cannot be expressed in a simple proportion but for coal fires it is at least relatively as bad as for the quantities of flue gases.

Furthermore, the air pollution effect of coal fires is greatly increased by the discharge of the flue gases at a low level and in very small quantities which are quickly cooled down. It can often be observed that the smoky air is falling down into the streets. The heating effect of the houses causes at the walls an up-stream of the warmed air, and as a result a down-stream of the cooler air in the middle of the street. The force of this circulating effect being greater than the lifting force of the cooled flue gases causes the smoky air to fill the streets. In contrast, the flue gases of a large boiler plant rise to a considerable height before they are cooled down and, if the area of a town is not very large, are carried away and dispersed by the natural ventilating effect of the wind. Furthermore, the flue gases of large stations can be cleaned by electrostatic precipitation or other methods.

Finally, by co-ordination of heat and electric power generation, it would in the future be possible to generate the demand for heat and electric power with the same fuel consumption which is at present required merely for electric power generation. In other words, the total quantity of fuel which is at present used for space heating and hot water supply would be saved and the corresponding quantity of flue gases eliminated.

On the other hand the burning of smokeless solid fuel will eliminate only the visible smoke but it will not eliminate the pollution of air by flue gases. Moreover, the burning of smokeless solid fuel, perhaps with the exception of anthracite, is also accompanied by emission of grit as can be observed in certain town areas on the Continent, which are provided almost exclusively with central heating plants burning coke, by the blackening of the snow a day or two after it has fallen.

From the standpoint of district heating, heating by coal fires is a

waste of fuel, expensive, and always a nuisance to the neighbour. Coal fires, therefore, should only be used occasionally but all buildings of a town should be supplied with ample and cheap heat from mains in the streets like water, gas, and electric power.

It is often said that in this country, with its mild climate, there is no need for district heating. This is not so, firstly, because the ever increasing number of central heating plants shows the need for centralised heat supply and, secondly, the decisive factor is the quantity of fuel which is used for domestic purposes. Owing to the longer duration of the heating season, the greater demand for hot water and ventilation, and of course to the poor efficiency of coal fires, the annual consumption of fuel per head of population for heat supply is, in this country, approximately 50 per cent. higher than on the Continent. By the general introduction of district heating it would, in the future, be possible to save in towns and cities more than half of the total coal which is at present burnt for space heating, hot water supply and electric power generation.

It should be noted that the saving in coal was the main argument for the introduction of district heating in Russia. In the Spring number of *Smokeless Air* of last year I gave a short outline of the developments of district heating in Russia. In spite of great technical difficulties which are frankly admitted in Russian publications, and shortage of experienced labour, Russia is now leading in the development of district heating and the new Power Stations are already predominantly built for co-ordinated heat and electric power supply.

It might interest you that the Russian word for district heating corresponds to the English expression heatification. The conception is that in analogy with electrification all factories and all buildings of a town should be supplied with heat from electric power stations.

It can already be visualised that the fuel position in this country will also stimulate the introduction of district heating on a very large scale and this, I think, would be the best solution of the smoke abatement problem. From the town of the future the burning of coal, especially in small quantities, should be entirely eliminated, and the

total heat required for heating or manufacturing purposes generated in heat electric stations situated, as far as possible, outside the town.

Mr. J. W. YOUNG said :

Smoke, whether from an industrial plant or from a domestic chimney, to an engineer, is almost a direct measure of inefficiency, a fact which has been recognised by the use of instruments indicating the density of the smoke, in order to correct combustion conditions. The major causes of excessive smoke or, in other words, unburnt carbon are : (a) poor design of the grate or furnace, (b) inaccurate regulating apparatus, and (c) bad operation, although it is unfair to criticise operation where grate or furnace design is poor, or inaccurate control gear is fitted.

In industrial plant operation, hand fired coaling and damper baffling for air and flue gas regulation are certainly not accurate tools for this purpose. The average British workman is probably the best artisan in the world and, given the proper tools, will produce the best possible results, but are we giving him the tools ?

In order to follow correct operation, it is well to compare a boiler plant to any mass production factory where the rate of flow of the feeder sections must be correctly co-ordinated to bring an even stream of the component parts to the assembly line. *Smoke*, then, is due to the periodical over-feeding of coal or under-feeding of air. Thus it follows, to a large extent, that the control of an evenly regulated rate of flow of the services is the fundamental factor upon which efficient combustion depends. It is therefore suggested that carefully designed control, preferably inherently co-ordinated, is the ideal solution if *smoke abatement* in industrial boiler plants, however small, is to be achieved.

Modern practice shows that even for small boilers the application of automatic stokers, induced, forced and secondary air, all subject to central control, gives increased efficiency and the consequent improved fuel economy. The elimination of smoke is one of the many benefits arising out of this increased efficiency. Vast numbers of boilers, however, all have their services working on the old lines, and I suggest

that one of our endeavours should be to effect a large reduction in the number of these less efficient plants.

Domestic smoke abatement, on the contrary, cannot be so readily dealt with in this manner, as it is not economically possible to install control apparatus, nor is it humanly desirable to depend on skilled operation. If progress is to be made we have, therefore, to concentrate on (a) design of the fire-grate, (b) the type of fuel used, or preferably a combination of both. Legislation could probably insist upon cokes or non-smoking fuels only being used, but it is more than probable that bureaucratic control, especially in the home, will be most unpopular in the post-war period. Therefore it is upon grate design, possibly with the use of smokeless fuel, that the progress of smoke abatement appears to promise most hope of success.

It must, however, be clear that neither smokeless fuels nor more efficient grates will become popular unless some financial gain or decided increase in domestic comfort over that of the standard house fire can be demonstrated, and since the price of smokeless fuels does not appear to show any direct financial saving, then the grate must be designed to show clearly improvement in domestic comfort.

During an investigation into domestic heating and air conditioning some years ago, it was established that the difference in pressure between the air inside and outside the room is the governing factor in domestic comfort. So let us analyse the cause of this pressure difference with a normal sitting room. The pressure in the room with the usual standard fire-grate is reduced by the demand for air for combustion and by chimney draught, both of which affect exhaustion from the room. On the other hand the only means for make-up is through the openings between the floor boards and skirtings, or under the doors or window frames, and as these openings are small, cold external air blowing through, causes draughts across the lower portion of the room, on its way to the fire and chimney entrance, i.e. in the region of the comfortable chairs. Thus if means are taken to raise the room pressure

and to balance the pressure difference draughts will be eliminated and room heating will be more uniform.

Referring again to the industrial boiler plant where forced draught is applied to the underside of the fuel bed as primary air, and secondary air is supplied above the fire to enable combustion to be completed, so in our improved domestic fire-grate we will take our air for primary combustion from under the floor boards, and a further supply of air through the fire back for secondary air. Furthermore, we will take a third supply of air, heat it from the waste heat of the fire surround and chimney base and discharge it to the room as warm air.

With a fire grate designed on these lines, that is to say, having a heater delivering additional air to the room, the pressure in the room is increased, with the requisite elimination of draughts and increase in domestic comfort. Moreover, this increase in pressure, together with the primary air below the grate, improves the fire draught, and as the secondary air introduced above the fuel bed enables the excess carbon of household coal to be consumed, any type of solid fuel may be used.

Thus the fire, under these conditions, in addition to being capable of burning any smokeless fuel, will burn soft coals with a minimum of smoke discharge from the chimney. This type of grate is most suitable for smoke abatement, as, while it will burn any type of fuel, it will tend to burn away soft coal at a higher rate making this type of fuel uneconomic.

The Chairman of the North Western local centre of the Institute of Electrical Engineers has suggested in his chairman's address that one of the probable solution for domestic fuel economy is to ensure by legislation that only apparatus of approved design is allowed in post-war building and this seems also to be a most effective proposal in dealing with domestic grates and smoke abatement.

Mr. T. E. BIRTWISLE, M.B.E., said that, with his Vice-Chairman, he represented the Urban District Council of Castleford, and that he also represented, officially, the Sanitary Inspectors' Association.

He desired to assure the Conference that the Association would give whole-hearted support to the forward policy of the National Smoke Abatement Society.

The problem of smoke from dwellings was one of the greatest urgency and importance in regard to post-war reconstruction, and we had to impress this upon the Government Departments and others who would be responsible for directing large schemes of new housing. We had to see that they gave to it more than lip service, and that smokeless housing should not be simply a pious hope. Strong action was needed.

As an instance of what was happening today, he cited the case of coal-fired cooking ranges, being supplied to school canteens from a pool through the Board of Education. When the Architect's Department concerned was approached with a view to these appliances being converted to or exchanged for smokeless apparatus, the reply was that smokeless heating was too costly. It appeared that the Central Authority as well as the Local Authorities paid more regard to cost than to a clean atmosphere, while the effect upon the minds of the pupils in attendance at the schools could be entirely disregarded.

In his view, nothing was too costly, provided we were determined to have it.

He had hoped to see or hear something at the Conference about the new "Benllech" fire. If the claims made for it could be fulfilled, it would go far in effecting the reduction of domestic smoke.

We heard much about the need for conserving our coal supplies, and in this connection he wished to mention the large quantities of combustible smokeless material in the form of cinder, now being deposited at our refuse tips.

This material was, or should be in these days of national salvage, free from putrescible matter, and was quite suitable for use in closed ranges or boilers. He had experimented with screening this material, and had offered it for sale at 8s. 6d. per ton at the tip, but there had been practically no demand, a result which was somewhat disappointing.

He would like to support previous speakers in urging the extension of electrification of railway and road vehicles. As to road vehicles, the fumes and smoke emitted from Diesel and petrol driven engines were a great evil in congested areas, but suggested that before electric road vehicles could become popular, there would have to be found a way of reducing the dead weight of batteries which had to be carried, and of increasing the mileage available for each charging of batteries.

Mr. JAMES LAW (Sheffield, Rotherham and District Smoke Abatement Committee) said :

Future planning is going to be difficult and will need the full co-ordination of everyone concerned—Town Planning, Architects', Public Health, Engineers' and Estates Departments. In large cities there appears to be a singular lack of co-ordination between one department and the others.

With regard to legislation, Section No. 104 of the Public Health Act appears to be the only Section under which regulations can be made but as no suitable byelaws have ever been applied under this Section it is problematical whether the Ministry would sanction conditions suitable for the purpose. It appears very essential that when these byelaws have been agreed upon, there shall be co-opted on to the planning authority a combustion engineer who shall become the competent authority to decide whether the installation is suitable or otherwise.

Town Planners have given considerable publicity to the building of small ancillary towns where industry shall be carried out with the object of decentralising certain industries, but it is difficult to visualise nice clean little towns with one or two heavy steel-works installed in the centre of them. Where heavy industry is carried out the only reasonable solution appears to be to zone those towns or areas. Each district and area will have to find its own solution. What would be considered satisfactory at Nottingham or Leicester would probably be of little use in Birmingham or Sheffield.

This brings me to the Smokeless Zone and the necessity of putting plans into operation as quickly as possible. It is found that plans are being passed

as emergency measures in central areas for buildings and apparatus that is going to become a reproach to the Local Authorities for generations to come, I am referring to pre-fabricated buildings with coal fired cooking stoves that are being installed for emergency feeding purposes.

Many of our towns have opportunities of reconstruction on smokeless lines that will never re-occur; at least we hope they won't; but signs of weakness are apparent and a vigorous policy is necessary to check this retrograde movement.

Mr. THOMAS M. ASHFORD
(Senior Smoke Inspector, Glasgow):

I have listened with close attention and with much interest to the discussion throughout the session and while the Executive Committee had expected that there would be considerable digression from what was their term of reference for this conference I may say that there certainly has been considerable digression, even more so than usually does take place at these meetings. Much of the matter discussed, I am afraid, has had little bearing on the immediate purpose of the conference, that is, the proposed policy of the Society on questions of reconstruction as affecting our subject. The trend of the contributions to the discussion has been to recite many of the technical details connected with combustion problems generally and for that reason the few observations I have to make will be confined to the actual desiderata of the Executive Committee, as outlined under the six headings mentioned in the conference agenda leaflet.

Firstly, with regard to the nature of the regulations required for the operation of proposals relating to the pre-installation of new plants and appliances I am definitely of the opinion that the time is now ripe when plans for the installation of such new plants should be submitted to a competent authority which has special knowledge of this subject and above all an active sympathy and understanding of the necessity of smokeless conditions being obtained and maintained. Such a committee should be operated regionally and might be under the direct control of a local city or county engineer's department or public health department. After close scrutiny of proposed plans

a statutory permit would be issued enabling the plans to be given effect to by the applicants.

In this respect we have been remiss in this country. Such a procedure has been in force in India for many years, e.g., the Bengal Smoke Commission, with very satisfactory results, and is both in the interests of the community and the plant users and owners themselves. Such regional committees would be co-ordinated by a national body which would draft the framework or general requirements and national policy and it is on these stated general requirements that the regional committees would function having regard to the peculiar industries and conditions existing in their own areas.

Secondly, the legislative questions affecting the establishment of smokeless zones are obviously purely legal ones and would be dealt with by a competent legal body, whereas the problem of the application of smokeless zones in specific instances is a technical one and is one that would be dealt with by an architectural and town planning committee which would have the assistance of the aforesaid regional committees where necessary. In any case collaboration between the two such committees would be necessary.

Thirdly, the domestic component of the problem is a very wide and complex one and does not lend itself to the same immediate salutary remedial measures as is found in the industrial field. In this connection I take the view that not smoke abatement should be the key-note or slogan but smoke abolition. This can only be achieved in this field by the universal adoption of gas, electricity and prepared solid smokeless fuels. There are no half measures here and it is my considered opinion that the use of bituminous fuels for domestic purposes cuts right across all efforts being made to attain smokelessness in this field. Such a policy would and will immediately involve opposition from interested and vested interests on the plea that the non-use of bituminous fuels is going to cause economic dislocation in the industry and that it is futile because of lack of adequate supplies of prepared fuels. I disagree with this view entirely. None of us expects to have domestic smokeless conditions overnight. It is a somewhat long-term policy but it

is one which will have to be tackled fundamentally.

Fourthly, so far as the ways and means for developing and advancing the agreed proposals of the Society are concerned, some aspects of this question have been dealt with by previous speakers. Suffice it to say that meantime the attitude of the Society must be one of taking time by the forelock and being in the field early so that full advantage may be taken of the enthusiasm complex in reconstruction.

The discussion was then closed and the Conference discussed the resolutions that were submitted for consideration. It was agreed that in view of recent developments it was not the most opportune time to adopt a resolution on the lines of that proposed by Mr. Law, nor that there should be a resolution concerning colliery spoilbanks, as proposed by Mr. Robinson.

After amendment and additions the draft resolutions were finally adopted as follows :

RESOLUTIONS

(1) For Submission to H.M. Government and Ministries

That this Conference, recognising the very considerable advances in the prevention of air pollution that can readily be attained during reconstruction, calls upon the Government to give the problem the urgent and full attention that it warrants, for the purposes of materially improving public health and amenities, reducing a gross economic waste and assisting the better utilisation of our fuel resources.

In particular the Conference urges :

(i) That the Ministry of Health and the Ministry of Works consider the requirements and means to ensure smokelessness in all new housing.

(ii) That the Ministry of Health and the Ministry of Fuel and Power consider legislation to ensure that all new installations of fuel-burning plant shall be efficient for their purpose and capable of being operated smokelessly.

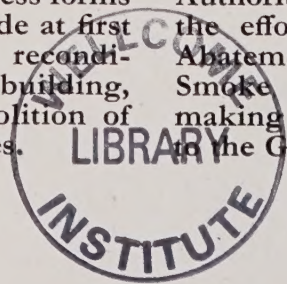
(iii) That the Ministry of Fuel and Power, in considering the development of the nation's fuel and power resources, plan for the increased production and most efficient distribution of smokeless forms of fuel and power, to provide at first for the needs of new and reconditioned housing and other building, and in due course the abolition of smoke from existing sources.

(iv) That the Ministry of Transport and the Ministry of Fuel and Power in every consideration of the question of post-war electrification of railways give the fullest recognition to the important reduction in air pollution that will accompany every extension of electrification, both suburban and main line ; and that this factor be also taken into account in considering the encouragement of electrically driven public service and other vehicles.

(v) That the Ministry of Town and Country Planning consider legislation and administrative requirements to make possible the establishment of smokeless central or other zones in towns.

(2) For Submission to Local Authorities

That Local Authorities throughout the country be urged to appoint special smoke abatement committees for the purpose of ensuring that full local examination of the problem in relation to reconstruction, and recommendations for action, may be made, with particular regard to town-planning, the establishment of smokeless areas, the zoning and control of industrial establishments, and the smokelessness of new housing ; and that, further, Local Authorities be requested to support the efforts of the National Smoke Abatement Society and the Regional Smoke Abatement Committees in making appropriate representations to the Government.



GENERAL PUBLICATIONS

of the National Smoke Abatement Society

(See over for post-war planning publications)

Smokeless Air.—The Society's quarterly journal (temporarily three times a year). The only magazine in the world devoted to the problems of air pollution. Gratis to members or 2/6 per annum, post-free.

Law of Smoke Nuisance.—By W. R. Hornby Steer, M.A., LL.B., Recorder of South Molton, Standing Counsel to the Society. This book, based on an earlier work by Randolph A. Glen and revised and extended in accordance with the Public Health Act of 1936, may be accepted as a standard work on the subject. In addition to the explanatory chapters, it contains tables of statutes and cases and the relevant sections from the two Acts and the Local Government Act, 1933. 8vo. 64 pages. 1/- paper backed ; 2/6 cloth bound.

The Case Against Smoke.—A booklet intended to give the reader a clear understanding of the nature and extent of the smoke nuisance by means of passages from a number of writers and speakers, each of whom is an authority in his own sphere. Also figures and extracts from official reports and tables. 24 pages, 4to. Price 3d.

Science Museum Exhibition.

Handbook.—This is not only a detailed guide to a scientific exhibition, but, containing a series of twelve authoritative articles on the main aspects of the problem, is a permanent and useful reference book. 80 pages, medium 8vo. Price 6d.

Conference Report.—The most complete review of the problem to be published for many years. Twelve papers and discussions in full. 116 pages, 4to. Price 2/-.

Fumifugium : or the Smoke of London Dissipated.—By John Evelyn. This fascinating book, published in 1661 by the author of the famous diaries, has been republished by the Society, with an introduction by Rose Macaulay. This indictment of the smoke evil remains true, eloquent and penetrating. With original wood engravings and a portrait of Evelyn. Paper covers, 6d ; cloth-bound, 1/6.

Smoke and Fumes Nuisances from Road Vehicles.—The technical and scientific aspects by Dr. J. S. Owens, and the legal position by R. P. Mahaffy. 16 pages, 8vo. 3d.

The State of the Atmosphere.—A valuable and informative paper by the late Sir Frank Baines, F.R.I.B.A. With a section on the effects of smoke upon building stone. Royal 8vo. pp. 36. 6d.

Smoke and Aviation.—A full report of a special conference on this now topical subject. 40 pages, 8vo. 6d.

Smoke Abatement and Fuel Economy in Steam Boiler Practice (Published by the Manchester and District Regional Smoke Abatement Committee). 12 pages, 1d., by post, 2d.

Britain's Burning Shame.—This pamphlet has been described in a review as "a masterpiece of modern popular propaganda." It puts the smoke problem in its simplest terms, especially as it affects the home, and is profusely illustrated. Single copies, 2d. 12/6 per hundred.

Conference Proceedings.—Copies are available at 1/- each of the full reports, containing papers and discussions, of conference held in 1932, 1934, 1937 and 1938. Others are out of print.

All obtainable direct from the Society, post-free

The Society's Publications on POST-WAR RECONSTRUCTION

Memorandum on Smoke Prevention in Relation to Initial Post-War Reconstruction.

The Memorandum submitted by the Society to the Government Departments concerned, which sets forth proposals by means of which, it is claimed, practically the whole of the post-war building could be made smokeless. 24 pages. By post, 2d.

No Clean City.

An illustrated pamphlet showing the need for smoke prevention in post-war reconstruction. This is in effect a supplement to the memorandum described above. 16 pages. By post, 2d.

Plan for Clean Air.

An easily read outline of the Society's proposals and the "Ten Year Plan" in the form of a "quiz" of twenty questions and answers. A useful publication to hand to the uninformed. 8 pages. By post, 2d.

These publications are available in quantity at reduced prices. 1/6 per dozen ; 10/- per hundred. We invite local authorities and others to help in their effective distribution